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## ABSTRACT

Counseling professionals' and counseling psychology students' interest in performing research seems to be waning. Identifying the impediments to graduate students' interest and participation in research is important if systematic efforts to engage them in research are to succeed. The Research Self-Efficacy Scale (RSES) was designed to measure self-efficacy beliefs regarding one's ability to successfully perform various research-related behaviors. This study examined four factors of the RSES: (1) Conceptualization; (2) Early Stages; (3) Presenting the Results; and (4) Implementation. Doctoral students (n=177) from a large mid-eastern university, representing a broad range of disciplines, were asked first to provide some background information and then rate their interest in research on the RSES. Results indicate that the RSES appears to have a coherent factor structure and thus has potential usefulness for understanding students' beliefs regarding their ability to complete various research tasks. Reliable measures of research self-efficacy beliefs may help predict a subject's involvement in research as a professional. The RSES may also be useful in pinpointing students' weak areas and thus help graduate programs develop research training curricula. Included in this study are two tables summarizing the study's statistical analyses. (RJM)

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A Factor Analysis of the Research Self-Efficacy Scale

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## ABSTRACT

Interest in research among counseling psychology students and professionals seems to be waning (Fitzgerald and Osipow, 1986; 1988). Identifying the variables which impede involvement in research seems crucial. The Research Self-Efficacy Scale (Greeley, Johnson, Seem, Braver, Dias, Evans, Kincade, & Pricken, 1989) is an attempt to assess and identify research self-efficacy beliefs. Participants included 177 doctoral students who completed the RSES and a demographic questionnaire. Factor analysis of the RSES indicated 4 primary factors: Conceptualization, Early Stages, Presenting the Results, and Implementation. Identification of the underlying factor structure of the RSES will be useful in understanding attitudes toward research.

### A Factor Analysis of the Research Self-Efficacy Scale

The occupational interests of both counseling psychologists and graduate students in counseling psychology have tended to move away from academia, toward private practice (Fitzgerald & Osipow, 1986; 1988). Though the expressed aim of counseling programs is to train students who will be committed to science and research in their careers, most students indicate an ambivalence toward the research process and a lack of strong research interest (Gelso, 1979; Magoon & Holland, 1984; Royalty, Gelso, Mallinckrodt, & Garrett, 1986). Identifying the variables which may impede graduate students' interest and participation in research-related behaviors is important if systematic efforts are to be effective in encouraging students to engage in research.

The application of Bandura's (1977) theory of self-efficacy expectations to the research training process may yield promising results in the exploration of internal variables important for research. Several authors have linked self-efficacy theory to the research training process (Betz, 1986; Royalty & Reising, 1986; Wampold, 1986). They hypothesize that inadequate research self-efficacy beliefs are a possible causal factor of students' lack of strong interest and participation in research-related activities. Research self-efficacy may be conceptualized as the degree to which an individual believes she/he has the ability to complete various research tasks (e.g., conceptualization, analysis, writing).

The examination of the nature and function of the construct of research self-efficacy would be facilitated by a

psychometrically sound self-report instrument. The Research Self-Efficacy Scale (RSES; Greeley, et al., 1989) was designed to measure self-efficacy beliefs regarding one's ability to successfully perform various research-related behaviors. The purpose of this study was to examine the factor structure of the RSES using doctoral students from a wide range of disciplines.

#### Method

##### Participants

The sample consisted of 177 doctoral students (93 women and 84 men) enrolled in a large mid-eastern university. This sample represented a broad range of disciplines: Humanities, 23%; Social Sciences, 28%; Biological Sciences, 32%, and Physical Sciences, 17%. Participants had been enrolled in their doctoral program for an average of 3 years.

##### Measures

Background questionnaire. Participants were asked to provide demographic information, including gender, age, graduate program, year in program, and research background. Participants were also asked to rate their interest in doing research in their graduate program and as a professional.

Research Self-Efficacy Scale. The RSE has 53 items, and was constructed with the following proposed factor structure: (a) Find and research an idea, 18 items; (b) Present and write an idea, 4 items; (c) Finalize research idea and method, 5 items; (e) Conduct the research, 8 items; (e) Analyze data, 6 items; and (f) Write and present results, 10 items. Subjects were asked to rate their ability to perform a behavior using a 100-point scale

ranging from "0," representing no confidence, to "100," representing complete confidence.

#### Procedures

Programs representing humanities, social sciences, biological sciences, and physical sciences (Goldman & Hewitt, 1976) were identified for inclusion in the study. Participants from each domain were randomly selected for inclusion in the study.

A packet was sent to all prospective subjects. The packet contained four items: (a) a cover letter; (b) the RSES; (c) a background questionnaire; and (d) a request to return the completed questionnaires. One month after the initial mailing, participants who had not returned their questionnaires were then sent a follow-up letter encouraging their participation. A total of 450 students were sampled; the return rate was 39%.

#### Results

Prior to any analyses, the questionnaires were screened for missing data. On some items, a few participants wrote "NA" in the strength score column or left it blank. Zeros were assigned to the missing confidence ratings because, given the instructions to rate each item, it was assumed that the participants' ability to perform these behaviors was poor. In addition, items 1 and 53 were not included in the factor analysis because these items assessed an individual's overall ability to complete a research project and were not expected to contribute to a particular subscale.

A principal-components factor analysis was performed with an oblique (Oblimin) rotation. This method of factor analysis was

chosen because of our interest in a theoretical solution and our expectation that the factors were intercorrelated (Tabachnik & Fidell, 1989). Arrindell and van der Ende (1985) have suggested that an adequate sample size for a factor analysis is approximately 20 times the number of factors retained. The analysis resulted in four factors being retained; thus, our sample size of 177 exceeded the recommended level.

The principal component analysis initially resulted in 11 factors with eigenvalues greater than 1. A scree test (Cattell, 1966) indicated that there was a break in size of eigenvalues between the fourth and fifth factors; a scree output indicated that the eigenvalues began to change directions after the fourth factor. A four-factor solution appeared to be the best approximate simple structure. See Table 1 for the factor correlation matrix. Table 2 contains the rotated factor loading matrix, communalities, item-total correlations for each factor, and means and standard deviations for each item. In the oblique solution, the four-factor solution accounted for all of the items in the RSES except two. Items 3 and 19 did not significantly load on any factor and thus were deleted from the RSES.

The first factor, labeled Conceptualization, had 16 items with factor loadings ranging from .41 to .79. This factor seems to represent the fundamental stages of formulating one's thoughts about a particular research area. The focus of the items appears to be on generating and organizing one's ideas about what is important in the literature and what invites inquiry.

The second factor, Implementation, had 20 items with factor

loadings ranging from .31 to .91. This factor seems to represent the behavioral tasks needed to conduct and complete a research project. It involves tasks such as using the computer, training assistants, obtaining human subjects approval, and collecting data.

The third factor had five items and was labeled Early Tasks. It had the fewest items of the four factors but had adequate factor loadings ranging from .42 to .63. This factor seems to represent one's attempts to brainstorm and find a research idea, as well as think about the relevant ethical principles of a research idea.

The fourth factor, labeled Presenting the Results, had eight items with factor loadings ranging from .45 to .88. This factor seems to represent the phase of research that entails organizing and preparing one's project for both written and oral presentation.

#### Discussion

In recent years, Bandura's theory of self-efficacy has been broadly applied to areas such as counseling skills (i.e., see Johnson et al., 1989; Larson, Suzuki, Gillespie, Potenza, Bechtel, & Toulouse, 1990). No studies, to date, have proposed or examined the properties of an instrument which measures research self-efficacy. Such an instrument may provide partial understanding of a specific "person variable" which may impede or enhance participation in research as a student or professional. Research self-efficacy may be effective in partially answering the question of why students lack strong interest in research-related

activities and subsequently do little-to-no research following the attainment of their degrees.

The RSES is designed to measure perceptions of performance capabilities regarding research-related behaviors. It appears to have a coherent factor structure for a sample of doctoral students from various disciplines. The RSES has potential usefulness for understanding students beliefs regarding their ability to complete various research tasks. The ability to reliably measure research self-efficacy beliefs may prove helpful when attempting to predict a subject's involvement in research as a professional. In addition, the RSES may also be useful in pinpointing the areas in which students feel particularly unable to perform, and thus help programs develop research training curricula.

As a result of this initial study, it was decided to revise the RSES and eliminate the instruction to place a check mark next to each behavior that the subject judged that he or she could perform at that time. Thus, only the strength column is included in the revised RSES. Furthermore, items 3 and 19 were eliminated from the RSES since they did not load on a factor of the RSES. Future researchers need to continue to examine the psychometric properties of the RSES, particularly in a sample of psychology students.

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Table 1

Factor Correlation Matrix

|                                   | 1           | 2          | 3           | 4           |
|-----------------------------------|-------------|------------|-------------|-------------|
| Conceptualization (1)             | 1.00        |            |             |             |
| Implementation (2)                | .50         | 1.00       |             |             |
| Early Tasks (3)                   | .59         | .27        | 1.00        |             |
| <u>Presenting the Results (4)</u> | <u>-.74</u> | <u>.53</u> | <u>-.45</u> | <u>1.00</u> |

Note. All the scales are significantly intercorrelated at the  $p \leq .001$  level

Table 2

Rotated Factor Loading Matrix, Communalities, Item Total Correlations, and Item Means and Standard Deviations for the RSES

| RSES Factor/Item                                                                                                     | I   | II   | III  | IV   | $h^2$ | Item | M    | SD   |
|----------------------------------------------------------------------------------------------------------------------|-----|------|------|------|-------|------|------|------|
| I. CONCEPTUALIZATION                                                                                                 |     |      |      |      |       |      |      |      |
| 16. Identify areas of needed research, based on reading the literature.                                              | .79 | .10  | .08  | -.04 | .65   | .70  | 76.9 | 20.9 |
| 18. Generate researchable questions.                                                                                 | .72 | -.08 | -.11 | -.13 | .62   | .70  | 76.7 | 21.0 |
| 20. Organize your proposed research ideas in writing.                                                                | .71 | .02  | -.01 | -.17 | .64   | .73  | 78.2 | 19.2 |
| 17. Develop a logical rationale for your particular research idea.                                                   | .67 | -.01 | -.02 | -.20 | .61   | .73  | 78.1 | 20.8 |
| 15. Synthesize current literature.                                                                                   | .57 | .16  | .20  | -.13 | .50   | .62  | 75.9 | 23.2 |
| 22. Present your research idea orally or in written form to an advisor or group.                                     | .57 | .11  | -.16 | -.38 | .57   | .64  | 78.5 | 18.2 |
| 11. Discuss research ideas with peers.                                                                               | .55 | -.01 | .35  | .10  | .49   | .61  | 85.8 | 17.8 |
| 24. Choose an appropriate research design.                                                                           | .54 | -.45 | .04  | .03  | .61   | .61  | 70.3 | 26.2 |
| 8. Evaluate journal articles in terms of the theoretical approach, experimental design and data analysis techniques. | .53 | -.13 | -.02 | .03  | .31   | .46  | 78.2 | 18.2 |

|                                                                                                              |      |      |      |      |     |     |      |      |
|--------------------------------------------------------------------------------------------------------------|------|------|------|------|-----|-----|------|------|
| 21. Effectively edit your writing to make it logical and succinct                                            | .48  | .08  | .05  | .27  | .43 | .59 | 78.6 | 18.2 |
| 26. Be flexible in developing alternative research strategies.                                               | .47  | -.43 | .02  | -.01 | .54 | .55 | 70.7 | 27.1 |
| 14. Decide when to quit generating ideas based on your literature review.                                    | .46  | .02  | .26  | -.24 | .54 | .70 | 68.5 | 25.9 |
| 13. Decide when to quit searching for related research/writing.                                              | .43  | .02  | .30  | -.29 | .60 | .72 | 70.9 | 24.2 |
| 12. Consult senior researchers for ideas.                                                                    | .42  | -.12 | .32  | .07  | .37 | .50 | 81.2 | 20.9 |
| 9. Participate in generating collaborative research ideas.                                                   | .42  | -.13 | .38  | -.01 | .49 | .60 | 75.5 | 24.6 |
| 23. Utilize criticism from reviews of your idea.                                                             | .41  | .04  | .12  | -.39 | .53 | .65 | 80.5 | 21.5 |
| II. IMPLEMENTATION                                                                                           |      |      |      |      |     |     |      |      |
| 39. Use a computer for data analysis                                                                         | -.01 | -.90 | -.23 | .01  | .80 | .79 | 65.3 | 36.6 |
| 41. Use an existing computer package to analyze data.                                                        | -.04 | -.88 | -.13 | -.02 | .75 | .80 | 65.6 | 36.8 |
| 33. Ensure data collection is reliable across trial, rater, and equipment. Understand statistical printouts. | -.06 | -.85 | .18  | .09  | .73 | .81 | 59.7 | 47.7 |
| 42. Interpret and understand statistical printouts.                                                          | .03  | -.83 | -.21 | -.02 | .70 | .74 | 60.7 | 34.6 |
| 32. Perform experimental procedures.                                                                         | -.04 | -.80 | .18  | .05  | .68 | .78 | 63.7 | 39.4 |

|                                                                                                                                                           |      |      |      |      |     |     |      |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|-----|-----|------|------|
| 27. Choose measures of dependent and independent variables.                                                                                               | .14  | -.80 | .12  | .09  | .72 | .81 | 62.0 | 33.8 |
| 38. Use computer software to generate graphics.                                                                                                           | -.08 | -.77 | -.20 | -.11 | .63 | .69 | 67.9 | 34.9 |
| 36. Organize collected data for analysis.                                                                                                                 | .08  | -.74 | .13  | -.15 | .73 | .83 | 72.5 | 33.7 |
| 35. Attend to all relevant details of data collection.                                                                                                    | -.01 | -.72 | .23  | -.13 | .70 | .80 | 67.4 | 35.2 |
| 31. Train assistants to collect data.                                                                                                                     | -.04 | -.69 | .39  | -.15 | .76 | .80 | 64.7 | 38.9 |
| 28. Choose appropriate data analysis techniques.                                                                                                          | .33  | -.66 | -.15 | -.03 | .64 | .70 | 62.8 | 30.4 |
| 34. Supervise assistants.                                                                                                                                 | -.07 | -.66 | .39  | -.12 | .70 | .76 | 67.0 | 37.3 |
| 40. Develop Computer programs to analyze data.                                                                                                            | .11  | -.63 | -.38 | -.03 | .51 | .52 | 40.2 | 38.9 |
| 44. Report results in both narrative and graphic form.                                                                                                    | .04  | -.62 | .05  | -.28 | .62 | .72 | 76.7 | 28.0 |
| 30. Obtain appropriate subjects/general supplies equipment.                                                                                               | -.04 | -.60 | .39  | -.09 | .61 | .69 | 69.0 | 35.0 |
| 48. Design visual presentations (posters, slides, graphs, pictures).                                                                                      | -.01 | -.57 | .09  | -.39 | .64 | .72 | 75.4 | 29.8 |
| 25. Choose methods of data collection.                                                                                                                    | .47  | -.54 | .00  | .09  | .58 | .62 | 74.4 | 27.1 |
| 29. Obtain approval to pursue research (e.g., approval from Human Subject's committee, Animal Subject's Committee, special approval for fieldwork, etc.). | -.16 | -.53 | .48  | -.16 | .60 | .62 | 63.4 | 39.0 |
| 37. Use computer software to prepare texts (word processing).                                                                                             | -.01 | -.46 | -.16 | -.29 | .36 | .50 | 88.4 | 24.0 |

|                                                                      |      |      |      |      |     |     |      |      |
|----------------------------------------------------------------------|------|------|------|------|-----|-----|------|------|
| 10. Work interdependently in a research group.                       | .27  | -.31 | .28  | -.03 | .38 | .46 | 77.5 | 27.3 |
| III. EARLY STAGES                                                    |      |      |      |      |     |     |      |      |
| 2. Follow ethical principles of research                             | .05  | .09  | .63  | -.18 | .49 | .52 | 86.7 | 23.9 |
| 4. Brainstorm areas in the literature to read about.                 | .19  | .17  | .52  | -.21 | .47 | .57 | 77.5 | 26.9 |
| 5. Conduct a computer search of the literature in a particular area. | .01  | -.26 | .51  | .07  | .35 | .43 | 87.8 | 18.6 |
| 7. Find needed articles which are not available in your library.     | .27  | .08  | .49  | -.03 | .39 | .53 | 82.7 | 21.7 |
| 6. Locate references by manual search.                               | .19  | .06  | .42  | -.12 | .31 | .54 | 87.1 | 22.1 |
| IV. PRESENTING THE RESULTS                                           |      |      |      |      |     |     |      |      |
| 50. Orally present results at a regional/national meeting.           | -.10 | .01  | .03  | -.88 | .70 | .70 | 71.5 | 25.8 |
| 49. Orally present results to your research group or department.     | -.12 | -.09 | .07  | -.88 | .76 | .76 | 79.6 | 20.5 |
| 52. Write manuscript for publication.                                | .03  | -.04 | .01  | -.74 | .60 | .72 | 72.5 | 25.2 |
| 51. Defend results to a critical audience.                           | .19  | -.06 | -.00 | -.67 | .65 | .74 | 67.9 | 25.8 |
| 47. Identify implications for future research.                       | .18  | -.20 | -.04 | -.59 | .61 | .72 | 78.7 | 23.0 |
| 46. Identify and report limitations of study.                        | .31  | -.20 | .02  | -.54 | .70 | .80 | 79.6 | 23.0 |
| 45. Synthesize results with regard to current literature.            | .32  | -.07 | -.04 | -.53 | .58 | .72 | 79.4 | 22.5 |

|                                                                                     |       |      |      |      |     |     |      |      |
|-------------------------------------------------------------------------------------|-------|------|------|------|-----|-----|------|------|
| 43. Organize manuscript according to appropriate professional format and standards. | .28   | -.04 | .11  | -.45 | .49 | .62 | 82.2 | 24.0 |
| Items deleted based on loadings below .40                                           |       |      |      |      |     |     |      |      |
| 3. Identify and seek funding to run a study.                                        | .29   | -.18 | .05  | -.27 | .34 | --  | 50.9 | 32.1 |
| 19. Keep an organized filing system of ideas and references.                        | .25   | .00  | .09  | -.27 | .24 | --  | 73.3 | 24.9 |
| Total eigenvalue                                                                    | 18.47 | 6.40 | 2.43 | 1.74 | --  |     | --   | --   |
| % Total Variance                                                                    | 36.2  | 12.6 | 4.8  | 3.4  | --  |     | --   | --   |
|                                                                                     |       |      |      |      |     |     |      |      |
|                                                                                     |       |      |      |      |     |     |      |      |
|                                                                                     |       |      |      |      |     |     |      |      |

Note. I=Conceptualization, II=Implementation, III=Early Stages, IV=Presenting the Results,  $h^2$ =communality, Item=Item Total Correlations, M=Item Mean, SD=Standard Deviation.